Community-based forest management plans in the Brazilian Amazon: current barriers and necessary reforms

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Abstract

Community-based forest management (CBFM) projects are often seen as an alternative to protect forest and at the same time to provide incomes for small landholders. Since the mid-1990s, the number of CBFM projects has increased in the Brazilian Amazon although most of them face several difficulties despite significant public support. Four CBFM plans were analyzed between 2005 and 2009 to assess the main barriers threatening their long term viability. Two plans are located in the State of Acre (Porto Dias Association and APRUMA) and two in the State of Para (Virola Jatoba Association and CANOR Cooperative). The first important barrier to successfully implementation of CBFM is the complex legal framework: it currently takes at least 2 to 3 years to get a plan approved. Public regulations and institutions have to become more efficient. Moreover management plan elaboration process is costly. None of the CBFM plan could have been successfully implemented without external national and international financial supports, as well as technical assistance. Finally, in the current Amazonian market context, timber harvest only represents a limited complementary income for small farmers, even if forest covers 80 % of their landholding. Market access is very uncertain and small holders communities do not systematically succeed in selling their timber at remunerative prices. Minimum remunerative public prices should be guaranteed for timber from such CBFM plans to make them a truly economic alternative for the Amazon smallholders.

Introduction

Community-based forest management (CBFM) is considered as an alternative to protect forest and at the same time provide complementary incomes for small landholders (Colchester et al., 2003). As the experience in developed countries attest, CBFM can emerge and flourish where the tenure and policy frameworks allow them to

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exist legally and compete fairly with large-scale enterprises (Molnar et al., 2007). Since the mid-1990s, the implementation of sustainable forest management has increased due to the efforts of international donors and environmentalists NGO's. However, only a few tropical countries have had favorable conditions in place for a sufficiently long time to enable their development.

The expectations from CBFM are significant when one considers the current worldwide trend toward devolution of forestlands to local communities (White and Martin, 2002). Indeed, communities managing forests for timber production manage, in some cases, to help alleviate poverty, to promote economic development, and to provide incentives for forest preservation (Wunder, 2001). The cases of Mexico and Guatemala are the most often cited, regarding community-based forest management success (Richards, 1992; Bray et al, 2005, Antinory and Bray, 2004).

In Brazil, the national networks supporting community forestry management have emerged from social movements of indigenous people, rubber tappers and civil society which, since the 1980s, have opposed to the central government's and international financial institutions' plans of opening up the Amazon to road-building, colonization, logging, mining, dams building and cattle ranching (Colchester et al, 2003). The public actions to address these stakeholders' claims started in the mid-1990s. The Promanejo Program (Program to support the Sustainable Forest Management in the Amazon), as a component of the PPG-7 (The Pilot Program to Conserve the Brazilian Rainforest), has supported several so-called "Promissory Initiatives" (Brasil, 2002). Between 1997 and 2007, the Promanejo has supported eleven CBFM initiatives in four Brazilian States (Acre, Amazonas, Rondônia and Pará). According to official data, the total area under community-based forest management reached 782.000 ha until 2005 (IEB and IMAZON, 2004). This data includes timber and non-timber forest

management projects (Figure 1). The state of Amazonas, followed by Para and Acre States, were pioneers in establishing CBFMs projects. However, these numbers don't mean all forest management plan registered in official bureaus were implemented. Most of them were canceled.

Insert Figure 1

The on-going experiences still face many difficulties. Why it is still so hard to develop and perpetuate CBFM projects in the Brazilian Amazon? Researchers agree their potential has not been realized in many countries due to a lack of clear tenure rights and adverse policy and regulatory environments (Smith, 1996, 2000, Molnar 2007, Brasil, 2002, RRI and ITTO, 2009). Policies and subsidy schemes have generally been designed for large scale formal industry in mind.

Regulatory frameworks in many countries disadvantage CBFM and greatly reduce their potential profitability. Many regulatory frameworks impose slow and costly permit granting processes. Internal challenges, local social inequities, limited technical and business skills, quality and scale production, and potential internal conflicts all require strong social/governance processes as well as appropriate access to market and other information and technical knowledge (Molnar et al, 2007).

Unfortunately, the Brazilian CBFM experiences did not overcome these barriers yet. This paper addresses one specific problem, often only poorly documented i.e. the problem of the long term economic viability of CBFM. The case studies are four CFBM projects supported by the Promanejo Program. The paper is organized in three sections. The first section describes methodological steps. The second section presents the main features of each CBFM plan analyzed. In the third section we present the main results of the cost-benefit analysis and the barriers to the long term economic viability of CBFM .

Finally, as conclusions, we summarize the most relevant issues and suggest some necessary reforms in publics policies aimed at promoting CBFM in Brazil.

1. Methodology

This paper focuses on four initiatives of community-based forest management in the Brazilian Amazon, located in the state of Acre and Pará State. All the four CBFM experiences were initiated by Promanejo (Figure 2 and 3). The Acre State was chosen because of its pioneer effort in promoting community-based forest management. The oldest experiences of community-based forest management are found in this State. The two initiatives selected involve the participation of two different groups of stakeholders.

The Porto Dias Association project, located in the Porto Dias Agro-Extractivist Settlement (figure 2), started in 1996. It has been supported by the WWF, Amazon Workers' Center (CTA), a local NGO, and Promanejo. The settlement covers 22,145 hectares and is located about 80 kilometers from Rio Branco, capital of Acre Sate.

Insert Figure 2

According to official data, 83 families live in the settlement. Two types of families are found: traditional rubber tappers and former landless farmers from several Brazilian regions. Each family occupies around 300 hectares of land. Nobody has private property rights over the land. The area belongs to the federal government. The legal instrument governing property rights is a contract between the Porto Dias Association and the National Institute for Colonization and Agrarian Reform (INCRA).

Families incomes come mainly rubber and Brazilian nuts. Agriculture is mostly for subsistence. Cattle ranching activity is quoted as a secondary income source. When

the CBFM project started in 1996, rubber tappers were experiencing a significant income drop due to Brazilian nuts and rubber low prices. The older generation of rubber tappers has fought since the beginning of the state colonization against cattle ranchers, in order to maintain their land right and protect natural resources. However, the new generation does not share the same history and often, for them, cattle ranching appears not only as a better economic option but also as a way to reach a better position in society (Toni 2004, Drigo 2005). These findings are similar to Colchester et al. (2003) in other contexts. In analyzing community forest enterprises in India, Indonesia and Nepal they have stressed the forest value perception was also diverse among the community-based forest management participants. Some "Indigenous Peoples" in these countries maintain a long historical relationship with a forest, which is currently changing due to accommodations to outsiders and to their own population growth (Colfer and Byron, 2001). In order to counterbalance this trend, in Brazil, NGOs started to promote the forest management inside Extractive Reserves. As mentioned above, the Porto Dias CBFM project has been supported by several institutions. However, despite such support, only eight families have remained involved in the CBFM project.

The second case of Acre State is the CBFM experience of APRUMA Association. The APRUMA Association is located in Pedro Peixoto Settlement (Figure 2). This is the larger colonization project in Acre State. It covers 318.000 ha and around 3000 families are living in the settlement. The small farmers had no experience in exploring forest products and. their income came mainly from cattle ranching (calves selling). In 1995, when the CBFM project begun, they were facing significant pasture productivity decline. Some of these small farmers were completing their income through the production of manioc flour. Some of them were receiving subsidies of the social government programs, as the "Bolsa Família" program reserved for low income

families. According Saldanha (2003), high poverty levels were found inside the community. With EMBRAPA Acre (Empresa Brasileira de Pesquisa Agropecuária) and Promanejo support, sixteen farmers associated to APRUMA decided to exploit their legal forest reserves. Like medium and large landholders in Amazon, smallholders have to conserve 80% of their property as forest.

In Pará State, two different experiences were analyzed. The first case is very similar to APRUMA case study. The Agro-Extrativiste "Novos Rumos" Cooperative – CANOR – is a small association of small landholders. The CANOR's members have been settled in an agricultural settlement of 70's, located in the municipality of Uruará in the Transamazon region (figure 3). Each smallholder has received a 100 ha plot. Cattle ranching activity is a relevant income source and farmers produce also corn and rice mainly for subsistence. Slash and burn practices are commonly used by most settlers. In 2004, twenty members of CANOR decided to start a CBFM project. However, the group was finally reduced to only six farmers because the others had problems with land documents and environmental legislation. Likewise, the timber forest management plan was supported by a pool of organizations. The first financial support came from Promanejo. The Rural Syndicate of Uruará and the FVVP Foundation (Fundação Viver, Produzir e Preservar) were the local organizations involved. Later, the CANOR initiative received the support of the Floagri Project, a project financed by the European Community (www.floagri.org.br).

Insert Figure 3

The fourth case analysed is the forest management plan carried out by the Virola Jatobá Association in the PDS Virola Jatoba. The PDS Virola Jatobá is a special

category of settlement, located in Anapu, Transamazon region (Figure 3). The settlement was created in 2003 and covers 29.000 ha. In this case, the internal division is a different one, more similar with Porto Dias case study. The legal forest reserve area is continuous, communal, and covers around 23.000 ha (80 % of the settlement area). The remaining are is divided in individual plots of 26 ha each, in average, where farmers can raise cattle and cultivate crops. The available official data register 183 families living in this settlement. They have no individual land titles. The settlers sign a kind of concession contract with the government. This contract assures long term users rights over land and forest. The community-based forest management plan begun in 2005 and was the last initiative supported by Promanejo. Our survey registered twenty-four families directly involved with forest management activities.

Using a qualitative approach, the conducted interviews were aimed at collecting data on cost and benefits as they are knew and expected among the beneficiaries of the four projects. The interviews were carried out in 2003 and 2004 in Acre State. Similarly, in 2007, 2008 and 2009, we carried out the research in Pará State. We have performed interviews with the rubber tappers and small landholders directly engaged in the four CBFM projects. We also interviewed the association's board of directors. In Acre State the total sample was twenty fours families, including those that have decided not to join to the forest management project. In Para State, the total sample was thirty participants, among them the association's directors. The NGO members, the forestry engineers, other technicians that worked directly with the community members, the sawmill owners and the governmental authorities were also interviewed. Moreover a detailed cost-benefit analysis was realized for CANOR and Virola Jatoba experiences, to help settlers decision choices amongst several scenarios of forest exploration.

2. The forest management plans main features

2.1. The APRUMA and CANOR plans

We describe first the CBFM experiences within the agricultural settlements where forests are individually owned, i.e.. the APRUMA Association (Acre State) and the CANOR experience (Pará State). As mentioned above, in general, the plots size is between 80 and 100 ha each. The Brazilian Forestry Code (Law nº 4.771) requires landholders in Amazon to maintain 80% of the property as legal forest reserve, a rule also applied to smallholdings. Thus, in theory, each plot has between 64 and 80 ha of legal forest reserve. The legal forest reserve of the plot can be considered as shared property because the smallholder can use the forest only under certain rules, issued by environmental authorities. The legal way to use the legal forest reserve is to submit and implement a forest management plan.

The members of the APRUMA Association in Pedro Peixoto Settlement expected to improve their family income. Each participant holds 80 ha of land. The forest management plan has set aside 40 ha (50%) of the plot to the forestry activity. This area was divided in 10 parcels with four hectares each. The forest management plan foresees a cutting cycle of ten years. This short cutting cycle was accepted by the environmental authorities due to the EMBRAPA's arguments regarding the low impact forestry techniques applied. The APRUMA's forest producers planned to cut 15 cubic meters per hectare (around three trees per ha). The timber was planned to be sawn inside the forest using a Lucas Mill mobile sawmill. They also had planned to use animal traction (*carro de boi*) to transport the sawn wood off the forest instead of skidders. According to the business plan prepared by EMBRAPA for APRUMA (Silva and Sá,

2005), each small farmer could gain around US$ 3.200 per year with this minimal annual productivity. The project also planned to sell certified sawn timber. The preferential market was, at that time, small and medium furniture firms located in Sao Paulo State.

The Cooperative Agro-Extrativiste “Novos Rumos” – CANOR – members hold plots of 100 ha each i.e. slightly larger than in APRUMA case study. Thus, each legal forest reserve was about 80 ha. In average, the settlers have decided to explore 10 ha per year. The initial plan was to harvest the maximum volume allowed (1.700 cubic meters in total or around 29 cubic meters per hectare). The CANOR’s members intended initially to saw all the timber and acquired a Lucas Mill sawmill from public funds. For timber transport, they decided to combine the use of animal traction with tractors to transport the sawn wood off the forest. The sawn wood transportation to the buyers would be done in rent trucks. The idea was to sell all the sawn timber in the local and regional market.

Table 1. The exploration scenarios planned by APRUMA and CANOR CFE's

	APRUMA (Pedro Peixoto Settlement)	CANOR
State/City	Acre/Plácido de Castro	Pará/Uruará
Participants	smallholders	smallholders
Number of participants	16	6
Property regime over land	Individual	Individual
Total legal forest reserve of the project	640 ha	364 ha
Annual area harvested	64 ha (separated parcels)	74 ha (separated parcels)
Exploitation model	Community and mechanized	Community and mechanized
	Plan approved in 1996 First exploitation in 1997	Plan approved in 2008 First exploitation in 2008
	No partnership with industrial timber enterprise	No partnership with industrial timber enterprise
	10 years cutting cycle	10 years cutting cycle
	15 m3/ha	15m3/ha
Benefits sharing	Individual	Individual
Elaborated by authors		

However, the CANOR's members gave up this scenario. Some facts have contributed to review the initial plans. First, the forest management plan submitted to the environmental bureau in 2004 was approved only in 2008. From this year, with the technical support of Floagri Project, they decided to implement a more prudent exploration scenario. Instead of harvesting 29 cubic meters per hectare, they agreed to harvest 15 cubic meters per hectare (1.100 m3 of round timber). They partially abandoned the idea of selling all the timber as sawn wood. Only the three most value

species were planned to be sawn after negotiating a subcontract with an industrial sawmill.

2.2 The Porto Dias Association and Virola Jatobá Association

For these two case studies it has to be underlined that the settlement models were specifically designed to favor sustainable forest management. The forest area is bigger than in the other settlement models. Agricultural and cattle ranching activities are allowed only in 10 per cent of the plot area. All the forest area is commonly owned.

In Porto Dias Association, each settler holds a 300 ha plot. The plot is divided in ten areas. Each area has 10 ha. The cutting cycle is 30 years. According to the forest management plan they can exploit 10 cubic meters per hectare of each area (100 cubic meters per area). This forest management plan is very close to a communal one since the participants decided that not all parcels are exploited at the same time every year. In fact, only four areas were planned to be logged each year (40 ha exploited per year, 400 cubic meters per year).

All production costs and annual benefits are shared among the eight participants. Likewise, all the equipments used in forestry activities are communal property. Most equipments were acquired through Promanejo financing (a truck, a second hand industrial sawmill, a tractor and a diesel power generator). They also built a small wood factory in the settlement to manufacture small wood objects and furniture. Like others, the Porto Dias Association initial goal was to sell only sawn timber.

Since the beginning, the Porto Dias Association members have joined the Group of Forest Producers of Acre State (GPFAC). This association was sponsored by the WWF. The aim of the informal organization was to find buyers and to intermediate contracts to sell the timber of the CBFM experiments in Acre State. The main market

for the Porto Dias timber was the certified industrial buyers of the southeast region of Brazil (Sao Paulo). In 2007, this informal group was dissolved. The CBFM projects stakeholders of Acre State decided to found a unique Cooperative, the Cooperfloresta. The organization purpose is to assist the CBFM projects in all phases of the forest production management. In recent years, this organization has achieved to build an industrial sawmill. In 2009, Cooperfloresta was in charge of transportation, sawing and trading of all the timber production of the CBFM projects in Acre State.

For the Virola Jatoba case study, the most distinctive feature of this arrangement is that legal forest reserve is continuous. The property regime over legal forest reserve is common property. The forest management plan established a 25 years cutting cycle. The maximum harvest intensity is 16 cubic meters per hectare. According to the forest management plan, the area to be harvested is 1.000 ha in an annual basis (16.000 cubic meters per year). However, in 2008, the members have decided to harvest only 500 ha (8.000 cubic meters expected in this year).

Another distinctive feature of the Virola Jatobá Association experiment is the fact that since the beginning, the association members invested in building a community-enterprise partnership. In 2007, they succeed in signing a contract with a wood tropical flooring firm, located in Belém, the capital of the Pará State. The contract length is 15 years (2008-2023). During this period, the firm is in charge of all production activities and support all exploration costs. The price per cubic meter for each species is previously negotiated between the enterprise and the Association. In 2008, the average price negotiated reached US$ 29 per cubic meter [1]. The Virola Jatobá Association, with the assistance of their sponsors, negotiated some others social and economic clauses to enhance benefits to community. One of the contract clauses states that the enterprise has to employ a certain number of community workers. Another

clause establishes that the enterprise must deliver 10% of the round timber harvested to the free Association use.

Table 2. The exploration scenarios planned by Porto Dias and Virola Jatobá Association

	Porto Dias	**Virola Jatobá**
State/City	Acre/Acrelândia	Pará/Anapu
Participants	Smallholders	Smallholders
Number of participants	8	24 directly involved, benefit shared with all 183 families
Property regime over land	Concession granted by government in a long time basis	Concession granted by government in a long time basis
Total legal forest reserve of the project	2.400	23.000
Annual area harvested	400	500 ha (first year-2008) 1.000 ha (for the next years)
Exploitation model	Community mechanized	Enterprise mechanized
	Plan approved in 1999 First exploitation in 1999	Plan approved in 2005 First exploitation in 2008
	No partnership with industrial timber enterprise	Partnership with in industrial timber enterprise
	30 years cutting cycle	25 years cutting cycle
	15 m3/ha	16 m3/ha
Benefits sharing	Only among the 8 members	With all families
Elaborated by authors		

3. Assessing the economic viability of the Forest management plan

In this section we present the main costs and benefits encountered in the four cases studied.

3.1. The APRUMA and CANOR cases studies

The small forest producers associated to APRUMA (Pedro Peixoto Settlement in Acre State) and those associated to CANOR (Pará State) share not only the similarly

features regarding their forest management plans. They have faced the same problems regarding costs and benefits.

The APRUMA experience was previously analyzed by Araújo de Souza (2003). The author has studied the cost and benefits of the forest management plan two years after its implementation. This author found out a total production cost of US$ 61 per cubic meters of sawn wood produced. According the author, in average, the price offered in the Acre's local market it was US$ 79 per cubic meter of sawn wood. Silva e Sá, (2005) showed that in the first years (1997-2000) each APRUMA's CBFM participant produced 11 cubic meters, in average. Each family earned thus annually US$ 869. In the period of 2001-2003 this production dropped radically: 6 cubic meters in average per CBFM participant. Even if the APRUMA has achieved forest certification in 2003, production decline was not stopped.

Our interviews showed that finally the real income has varied a lot among the participants. Some farmers did finally not start exploration. In fact, until 2003, only three farmers had achieved around US$ 800 per year selling sawn timber. According Araújo de Souza (2003), the others participants registered losses due to the high production costs they faced.

There are three main reasons explaining these negative results. There was no demand for all the species available in the forest management plans. The farmers have thus explored just one or two trees by year. It is important to underline that the areas of the Pedro Peixoto Settlement are not covered by high value forests. Second, due to the low experience in operating the portable sawmill, the productivity of the sawn wood was lower than the expected one (around 30%). Thirdly, even if the sale contract was intermediated by NGO's and there was a negotiated price for the certified timber, the small quantity and bad quality of the timber logged did not allow to reach higher

income from forest exploration (Drigo, 2005). In 2007, the APRUMA's FSC certification was finally suspended. The main reason for the certification withdrawn was the fact that the major part of APRUMA's member had stopped to log..

The CANOR experience faced serious similar problems too. When the forest management plan was finally approved (four years after its submission), the small producers was deprived of capital. Moreover, the CANOR manager has attempted to negotiate a sale contract before starting exploration, but this goal was not achieved. Despite remaining uncertainties, CANOR has decided to explore the six forest parcels (74 ha) and to log 1.048 cubic meters in total (174 cubic meters per participant in average). They decided to share the costs of production. Another decision was to subcontract the machinery (skidder) and transportation services amongst the neighbors (farmers living in the settlement).

Some family's participants got involved in forest production tasks, mainly in logging activities. Regarding the sales, the CANOR managed finally had an oral agreement with a local industrial sawmill of Uruará to saw the three more valued species of timber. The agreement included that the industrial sawmill would negotiate the sawn timber with a buyer outside the State of Pará. For the rest of round timber, CANOR had to find out a local buyer.

Drigo and Piketty (2010 forthcoming) assessed from an ex –ante cost benefit analysis that such exploitation scenario may generate a net benefit between US$ 1100 and US$ 2200 per family per year during 08 years (harvesting 10 ha in average per year in a 80 ha legal forest reserve area). There are two factors impacting family's income. First, the distribution of the species among plots is nor homogeneous. Indeed, there are forest plots with more valued species than others. Secondly, when the families involve more members in the forest management activities, they economize in subcontracting

external people to perform forest management tasks.. But the scenario assumed that all timber logged would be sold.

In 2008, the first year of forest management plan, Drigo and Piketty (forthcoming) found out a total production cost of US$ 53 per cubic meter of round timber. As shown in figure 4, the transportation cost represents 58% of the total cost followed by administrative costs. The logging activities cost were US$ 11 per cubic meter explored. It includes the internal forest area roads opening, the trees cutting and pulling with skidders outside forest plots. The legal and administrative cost was poorly registered by CANOR manager. But, it was estimated that they were about US$ 9 per cubic meter harvested.

Insert Figure 4

In average, according the CANOR manager information, the price reached for the round timber was US$ 62 per cubic meter. In opposition to the initial plan, only one timber specie was sawn. Thus most part of timber was sold as round timber. In sum, it seems that in this first year each participant of CANOR's forest management plan could gained US$ 870, in average. However, until the end of 2008 part of the timber logged (43%) remained unsold. Then, the CANOR has registered an important deficit in the first year.

3.2. The CBFM in the communal forests

In the case of the Porto Dias Association Project, there were no detailed prospective scenarios made on income potential of forest management. The interviews revealed an income expectation of U$ 2.500 per year for each family. Araújo de Souza (2003) has find out a total cost of US$ 59 per cubic meter of sawn wood for this experience. Until 2006, the average price offered for the sawn wood of Porto Dias Association was about US$ 380 per cubic meter. However, the participants faced problems to accomplish the sale contracts.

At first place, the internal road bad conditions in the settlement slowed down the forest operations. As a consequence, the Porto Dias Association achieved to log around 170 cubic meters per year and not 400 cubic meters as planned (Cooperfloresta, 2006 Report). Other limits were the technological and the organization issues. The old industrial sawmill acquired was a costly one. The energy costs were high. It was necessary to maintain the diesel power generator functioning for many hours in order to saw four or five cubic meters daily. Moreover, the sawmill was frequently broken. Finally, some participants reported additional unexpected costs. They reported the necessity to subcontract workers to substitute them in the normal agriculture tasks during the timber harvest period. Finally, even with the donor's assistance, one could register delays in the contract payments. The buyers interviewed reported quality problems which explained the payments delays (Drigo, 2005).

The Porto Dias Association operational conditions started to shift with Cooperfloresta foundation. In 2007 and 2008, the participants of forest management plan abandoned the attempts to saw timber. They concentrated efforts to log round timber and supply Cooperfloresta. The new institutional arrangement, boosted by the Acre State's government, had transferred to the Cooperative the managerial and sale

tasks. It means that the community members have concentrated efforts to log. The transportation, sawmill and sales costs (including, advertisement, negotiation time with subcontractors and buyers) is supported by Cooperfloresta. Due to this new arrangement, the exploitation cost supported by the Porto Dias forest producers were about US$ 19 per cubic meter, in average. According the Cooperfloresta manager information, since 2007 the Cooperative pays around US$ 100 per cubic meter of round timber. Hence, the Porto Dias Association forest producers achieved better gains. However, it is important to remark that the most part of Cooperfloresta and community forest producer's costs is still highly subsidized by donor's funds.

The Virola Jatobá experience seems to be a more promising one. The first year of the community-enterprise partnership was a learning period. The timber production was not the expected one. Instead harvesting 8.000 cubic meters in 500 ha, the enterprise has achieved 4.000 cubic meters of round timber. According, the enterprise's technicians, the reason for the timber volume loss was some inaccuracies in the previous forest inventory. Unfortunately, the production costs were not disclosed by the enterprise for confidential reasons. The gross benefit to the Association was US$ 119.000. The data available registers a net benefit around US$ 536 per family or 23 US$/m3. Even though the enterprise supports the exploitation costs, the Virola Jatobá Association carried out part of the administrative and legal costs. They paid mostly the legalization costs of the Association and legal taxation. In this case, these costs were about US$ 6 per cubic meter of round logged. In fact, the expenditures to execute the first forest inventory and to prepare the forest management plan were much higher (around US$29 m3 per cubic meter). They were paid by the Promanejo fund. But, this number reveals a worry situation. If the Virola Jatobá Association had had to pay for all

first years expenditures, there will probably be too short profits to share during the first years.

Pokorny and Merry (2005) studied the administrative and legal cost of professional timber enterprises in Pará State. They found a cost around US$ 8 per cubic meter logged. In general, the community forest enterprises spend more in these cost items due to the worst organizational and institutional conditions they face. In the case of Virola Jatobá experiment, the community's members have spent money to legalize the Association. The bureaucratic process to approve a forest management plan is also costly. It demands several trips to register the documents in the official bureaus and tax payments office.

For the next years, it is expected that the forested area and round timber production will rise (1000 ha/16.000 m3, respectively). The net benefit may be maintained (US$ 23 per cubic meter). The enterprise has assumed to support some costs (forester salary, annual forest management plan preparation and submission, etc.). Although, it is expected that the Virola-Jatobá Association will share forest inventory costs with the enterprise. In addition, the Association members also reported the aim to achieve a forest certification. Due to this arrangement, the administrative cost beard by community shall decrease (around US$ 3 per cubic meter). According Drigo and Piketty (forthcoming) in ideal conditions (i.e. utmost production achieved and all administrative costs paid) the net benefit could be around US$ 2000 per family. But, it will depend on a better inventory of the annual areas to harvest to avoid false expectations.

4. Conclusion-discussion

The cost-benefit study of the four CBFM cases in Brazilian Amazon showed that the community-based forest management faces huge challenges to secure long term

viability yet. The two CBFM experiments in agricultural settlement were especially fragile. Neither APRUMA (in Acre State) nor CANOR (in Pará State) has achieved the net benefit expected due to the high production cost (US$ 79 per cubic meter of sawn wood and US$ 59 per cubic meter of round wood produced, respectively) compared with the low prices offered by the local timber buyers. In APRUMA's case, Araújo e Souza (2003) stated that the minimum price should be around US$ 100 per cubic meter to the sawn timber if one would like to assure some benefit. In the case of CANOR, it will be necessary to pay at least US$ 60 per meter cubic of round timber to compensate the costs. It is important to remember that in the two cases above the community associations support the transportation costs which represent the higher share of production cost.

Unfortunately, the bad conditions of the internal settlement roads and external roads raise significantly the transportation cost in Brazilian Amazon. In addition, the administrative and legal costs are almost prohibitively for small farmers and rubber tappers communities. At minimum, it is necessary to hire a forester and an accountant to deal with technical, fiscal and legal documentation. Because of that, until 2009 there were no CBFM independent initiatives. The donors were and are still essential for their relative success.

The market conditions were not good too. The local buyers are not incentivized to pay fair prices. In general, they only purchase the most valued species. It is also difficult to communities to reach others markets without NGO's or donor's assistance. The buyers of the central region (Brasilia) and southeast region of Brazil (São Paulo) demand sawn wood that is costly and risky to produce. It is also true that they are exigent with timber quality. The communities are not equipped nor prepared to saw high quality timber.

But, not all are bad news. The Porto Dias Association (in Acre State) shift toward joining the Cooperfloresta (as the others CBFM projects in Acre State) seems to be a more promising arrangement. The forest management plan's participants gave up sawing timber. They have concentrated to log better. Nevertheless, it is important to remember that Cooperfloresta experience is still financed by government and the WWF. One can say that Porto Dias Association has achieved better sales condition. However, the production costs are still high due to the internal roads bad conditions.

The case of Virola Jatobá Association stresses the advantages of the community-enterprises partnership. But, even in this case, forest management net benefits are only a complementary one. Such result underline that it is necessary to invest in research-development activities to support the implementation of sustainable cattle ranching and agricultural activities in the limited area allowed to be deforested.

Finally, we delineate some suggestions to the Brazilian public policy regarding community-based forest management. It is indispensable to improve road conditions to boost CBFM in Brazilian Amazon. The case it is not only to pave the main roads, but to invest to maintain the internal roads in the rural and forest settlements. The roads in bad conditions impose costs to sell the entire production of the settlers, not only timber. Moreover, to promote CBFM in rural and forest settlement, it is necessary to know the real timber stock and find a solution for the species currently difficult to sell at good price. In general, each community supported by its donors achieves to perform the inventory of the first parcel to be harvest. But, an extensive inventory in the entire legal forest reserve can allow preventing false expectations regarding potential benefits Besides, they can allow settlers and community plan better the future timber sales.

Another important action is to fight illegal logging. Even if Brazilian authorities have invested in forest control in the last years, it is still easy to find illegal timber in the

market. As a consequence the timber prices are pushed down. As we could observe during interviews in the Transamazon region, the most part of sawmill owners are not interested to hold contracts or to negotiate timber prices with communities. They continue to supply their sawmill with timber logged in private properties or even in settlements. It is not rare that these logging operations are legalized by false forest management plans approved for others areas. Government authorities do not manage to monitor all forest management plans. Two actions are needed. First, to increase the local monitoring in forest management plans. Unless local stakeholders are correctly involved in forest governance, it will be difficult to avoid illegal timber markets. Of course it remains difficult to define exactly how local governance shall be organized, as it is much more complicated than simple decentralization. More research is needed on this area. Second, it is necessary to lower the costs to approve the CFBM forest management plans. For instance, the government authorities could open new offices in the principal Amazon cities, not only in the capitals like Belém or Rio Branco. This could help to avoid multiple and lengthy trips to protocol forest management plan documentation.

Regarding market issues, regarding the many difficulties encountered by the communities to access remunerative privates markets, public involvement could be tested. For instance, the local or regional governments could preferentially buy timber from CBFM plans at guaranteed prices to build schools, medical centers, popular houses, etc. The current procurement mechanisms do not allow such scenarios because the supplier chosen is usually the one offering the minimum price. Indeed, it is a barrier to overcome. Furthermore, establishing an official list of minimum prices for timber from CBFM projects may help the CBFM managers to reduce speculation while negotiating with buyers.

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Figures

Figure 1. Number of CBFM Projects in Brazilian Amazon Region

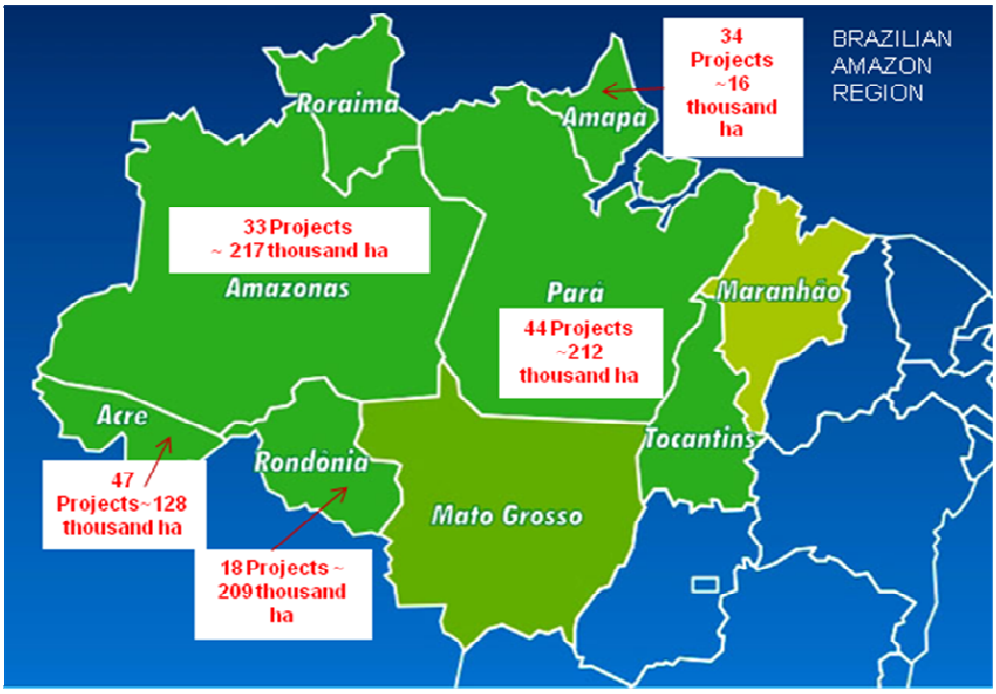


Figure 2. CBFM Projects Analysed in Acre State

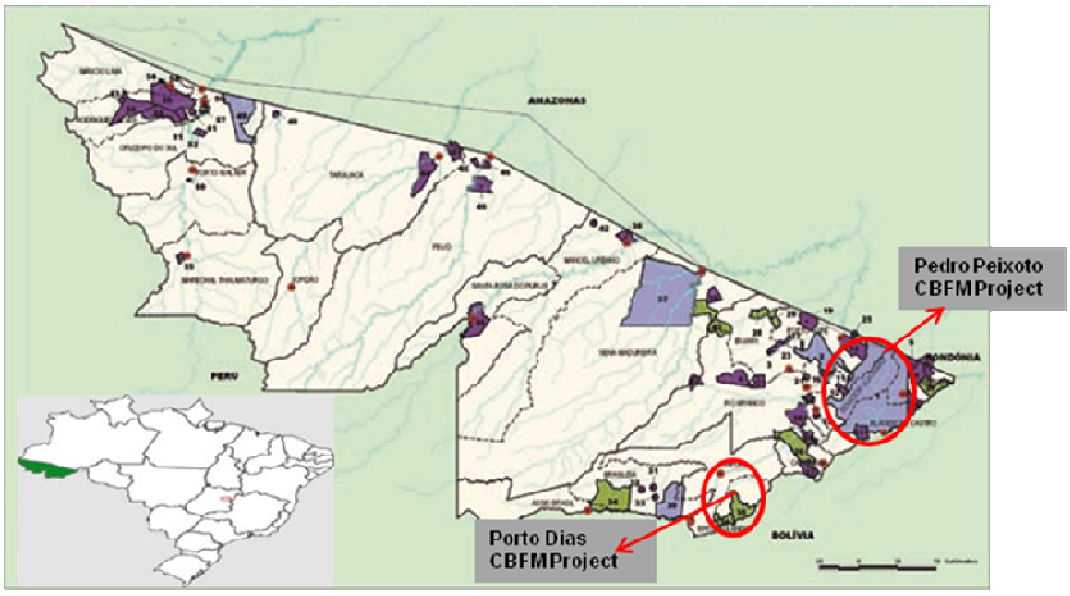


Figure 3. CBFM Projects Analysed in Para State

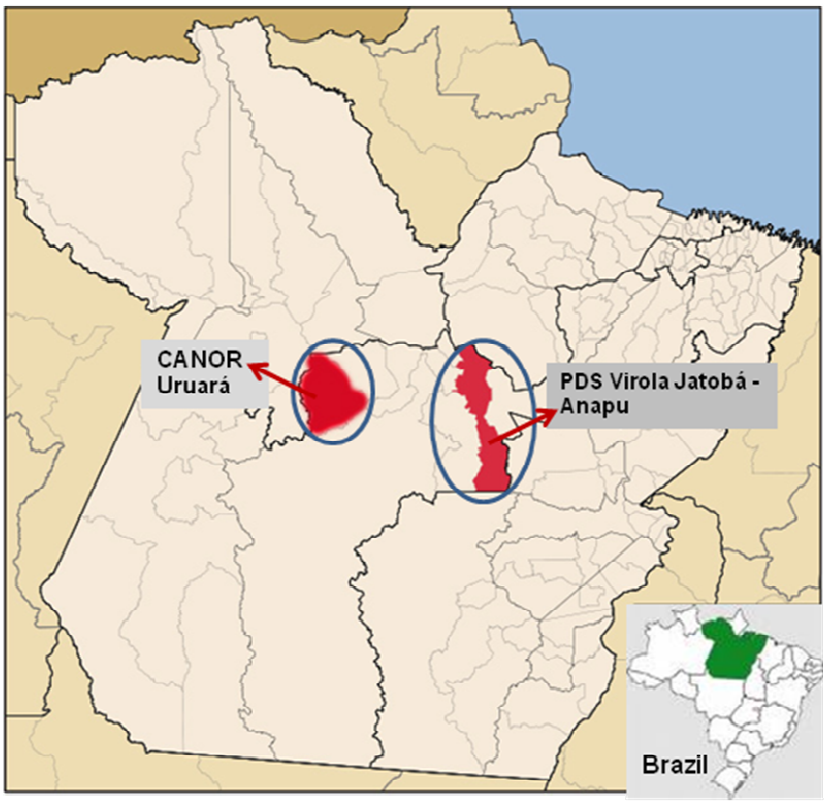
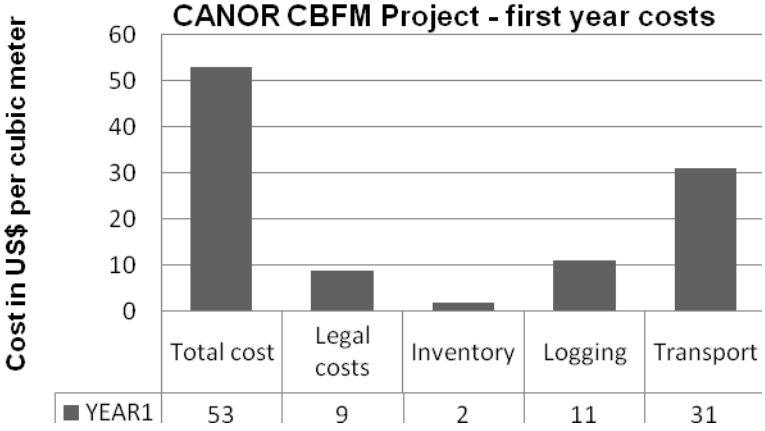


Figure 4.
CANOR CBFM Project - first year costs



Elaborated by authors

Footnotes

[1] For all calculations we have used the following dollar exchange rate= US$ 1,00 = R$1,84 in February 2010